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VIEWPOINT

# Venous Thromboembolism Risk Stratification and Chemoprophylaxis: A Meta-Analysis Finds No Benefit, More Risk

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Caprini scores and routine anticoagulation are promoted to reduce venous thromboembolism (VTE) risk in a meta-analysis published recently in *Annals of Surgery*.[1] However, factual errors beg disclosure.

Pannucci et al.[1] reported a 2.45% (149/6,085) overall VTE risk for patients who did not receive chemoprophylaxis but did not report the 4.37% (380/8,691) risk for patients who did receive chemoprophylaxis ($P < 0.0001$). According to Figure 4, the VTE rate for patients with Caprini scores of 5 and 6 was significantly greater for anticoagulated patients (3.54% versus 1.85%; $P < 0.001$).[1] For patients with Caprini scores of 7 and 8, the VTE risks were 5.37% for patients receiving chemoprophylaxis versus 4.02% for untreated patients, not significantly reduced for anticoagulated patients, as claimed.[1] Among patients with Caprini scores ≥ 5, the VTE risk was significantly greater ($P < 0.001$) for anticoagulated patients (comparisons performed using a chi-square test[2]).

One of the studies included in the meta-analysis, by Jeong et al.,[3] reported 19 VTEs among 574 plastic surgery patients who received chemoprophylaxis and only 5 VTEs among 1,024 patients who did not receive chemoprophylaxis ($P < 0.00001$). These numbers are much different from those reported in the meta-analysis (5/238 and 3/301, respectively).[1] Correcting this error reduces the $P$ value (already < 0.0001) favoring the untreated patients to essentially zero.[2]

Pannucci et al.[1] reported that anticoagulated plastic surgery inpatients with Caprini scores of 7 to 8 or > 8 have a significant VTE risk reduction. However, the referenced study found that these differences were not significant ($P = 0.230$ and 0.182, respectively).[4] Moreover, a subsequent review by the same lead author found no significant difference in VTE risk ($P = 0.08$) for plastic surgery inpatients when compared by Caprini scores but a higher risk of bleeding ($P = 0.02$) in anticoagulated patients.[5] The bleeding risk was also significantly increased ($P = 0.006$) in the recent meta-analysis,[1] contradicting a previous study that found no significant difference.[6]

The title references risk in surgical patients, but the authors included 1,176 nonsurgical patients.[7,8] The authors report poor comparability scores.[1] A bewildering number of confounding variables undermines the comparisons. These include a cancer diagnosis, having surgery, the type of surgery, anesthesia, the method of VTE diagnosis, follow-up interval, sequential compression devices, whether upper-extremity thromboses and superficial thromboses are included, and the method of evaluating the 40 parameters that make up a Caprini score. Retrospectively evaluating Caprini scores based on chart reviews or insurance billing information is unreliable.[9] For example, Obi et al.[7] recorded only 1 patient with a history of varicose veins among 4,844 patients admitted to an intensive care unit. Pannucci et al.[1] did not report the results of their funnel plot analysis to evaluate publication bias. The selected articles share a bias for chemoprophylaxis. One study grouped patients according to "appropriate" and "inappropriate" prophylaxis and called failure to administer chemoprophylaxis "malpractice."[10]

The false-positive rate for individual risk stratification is consistently 97% and almost half of the affected patients are missed using Caprini scores ≥ 7 as a cutoff.[11] This method can hardly be considered "precision medicine" or capable of predicting VTE risk, as claimed.[1] In evaluating the American Association for Accreditation of Ambulatory Surgery Facilities data for 354,969 abdominoplasties, Keyes (Personal communication, February 7, 2017) finds Caprini scores unhelpful because 135 (67.5%) of the 200 VTEs occurred in patients with Caprini scores < 5. The evidence-based surgeon will make treatment choices based on the facts, not the conventional wisdom.

*Facts are stubborn things.* —John Adams.

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## DISCLOSURE

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